

The Classic

An Improved Prosthesis for a Syme Amputation

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A Syme amputation, which is the most conservative below-the-knee amputation and which provides the best functioning stump for weight-bearing, has been rarely recommended for women, because the unsightly prosthesis is objectionable.

Some time ago it was necessary to amputate the foot of a female patient, twenty-two years old. After a conference with the young woman, it was decided that the many merits of a Syme amputation far outweighed the objection of the unattractive prosthesis, and an amputation of the Syme type was carried out. A very good stump was obtained, and it was fitted with the conventional prosthesis. Although the artificial limb was most serviceable, it was indeed unsightly and our patient was very unhappy. The problem of finding a more pleasing prosthesis was discussed with our limb maker and, after several attempts, a very neat, light, and functional prosthesis was constructed from laminated plastic material reinforced with glass cloth. After the first lamination or molding, a window was cut out of the back of the prosthesis sufficiently large to allow the stump to slip completely into the socket. Following the last lamination, the open area was closed with a leather lacer.

Although the stump had the usual bulbous end, it was possible to make the bulge less apparent by the proper build-up of the shin portion of the prosthesis and by thinning the plastic material in the region of the malleoli during the laminating process.

Details of Preparation [1]

A plaster-of-Paris mold of the stump is made extending to the knee and closed distally. From this mold an exact model of the stump is made in the usual way with the usual vented tube incorporated to serve as a handle at the upper end. The landmarks and the plumb-line are redrawn on the model with an indelible pencil. Additional plaster cream is used to accentuate bony prominences and sensitive areas. The model is then thoroughly dried at 140 degrees Fahrenheit and coated with a plastic parting agent to keep the mold from adhering to the model.

Two layers of stockinet are drawn tightly over the model and carefully stitched about the distal end; next, glass cloth is added as reinforcement in the upper and lower thirds. Three more layers of stockinet are then drawn tightly over the model and tied about the handle.

A polyvinyl alcohol sheet is formed into a bag over a template in the usual manner. The bag is then stretched over the model and the proximal end is tied tightly around the handle. Plastic resin is poured into the open end of the polyvinyl alcohol bag and is forced into the layers of stockinet as the cone-shaped bag is pulled proximally over the model. The forcing of the resin into the stockinet is facilitated by massaging the bag toward its proximal end. All wrinkles are pressed out and all air is forced out of the

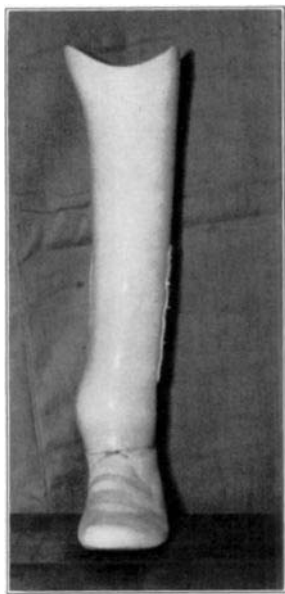


Fig. 1 Photograph of the front view of the plastic Syme prosthesis without a shoe.

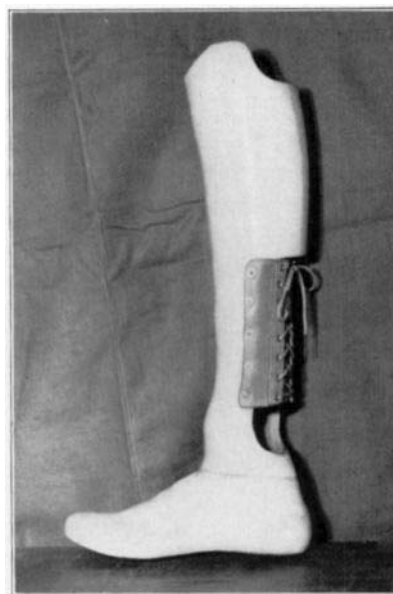


Fig. 3 The size of the leather lacer may be seen in the side view.



Fig. 2 This view illustrates the leather lacer and the cavity required to accommodate the bulbous stump.

stockinet. Mixed styrene polyester resins are used in the proportion of one-half rigid and one-half flexible.

The polyvinyl alcohol bag is then tied tightly over the distal end of the mold, and curing is effected at 130 to 140 degrees Fahrenheit for about thirty minutes. After the resin has jelled, the final cure is effected at 250 degrees Fahrenheit for approximately thirty minutes.

The top of the mold is trimmed and the plaster model is removed while the mold is still warm. This mold is the trial socket. It will be attached to a foot portion and after adjustments will serve as a mold for the final complete prosthesis.



Fig. 4 When the prosthesis is worn by the patient, it may be seen how successful has been the attempt to make the prosthesis follow the contour of the normal leg.

A foot of the proper size is selected, giving consideration to the heel height. A set-up for length and alignment is made by setting the trial socket on the foot and temporarily securing it with steel bands from the foot to the shin by small screws. The back side of the socket is cut out sufficiently to allow the stump to be inserted. The trial socket is now fitted to the stump and adjustments are made so that it is comfortable during standing, walking, and sitting. When the socket with its attached foot is entirely comfortable, the screws are replaced with rivets and the unit is ready for the final lamination.



Fig. 5 The appearance of this prosthesis when the patient is fully dressed. This prosthesis has been fully accepted by the patient, and in her opinion it is much superior to any of the conventional types of prosthesis used previously.

The foot is trimmed until it is undersize, and the outer surfaces of the foot and socket are roughened with a fine rasp or sandpaper. To obtain the most pleasing cosmetic effect possible, the spaces from foot to shin are filled with a compatible resin and filler. It is cured and sanded. The socket is now coated inside with a plastic parting agent and a second model of plaster-of-Paris is poured into it, a vented tube having been installed and all openings having been sealed.

For the second lamination, two layers of stockinet of appropriate size are pulled over the toe portion, up over the bands on the shin, and stretched tightly but not tied. Glass cloth reinforcement is wrapped about the wood of the foot and over the top of the connecting hands. Three additional

layers of stockinet are pulled into place so that the first layer extends from the toes to two inches above the glass cloth which includes the top of the hands. It is stretched tightly; the second and third layers are stretched from the toes to the top of the socket and tied around the vented tube with linen thread.

The same technique and the same resins are used in this lamination as in the first one, except that the resin mixture should be 70 per cent rigid and 30 per cent flexible styrene polyester resins. The mold is oven-cured, and the top and back openings are trimmed to the original size while warm. All cut edges are smoothed and sealed so that moisture cannot penetrate the cotton fiber. Excess plasticized stockinet is cut from the foot which is sandpapered, the edges being feathered so that no ridges remain.

A leather lacer is attached over the back opening. The foot is covered in the usual manner and the prosthesis is ready for final fitting and use.

Summary

With this prosthesis it is possible to overcome the major objection to a Syme amputation in women patients and to offer them the many advantages of the weight-bearing, below-the-knee amputation of the Syme type.

Reference

1. STAFF OF ARTIFICIAL LIMBS PROJECT, Department of Engineering, University of California. Manual of Upper Extremity Prosthetics. Edited by R. Deane Aylesworth. Los Angeles, University of California, 1952.